

ASSESSMENT FRAMEWORK AND MODEL QUESTION PAPER

COMPUTER SCIENCE

Grade XI

NATIONAL CURRICULUM
2022-23



INCLUSIVE SCHEME OF STUDIES 2024



FEDERAL BOARD OF
INTERMEDIATE AND
SECONDARY EDUCATION,
ISLAMABAD

WE WORK FOR
EXCELLENCE



FEDERAL BOARD OF INTERMEDIATE AND SECONDARY EDUCATION

H-8/4, ISLAMABAD



ASSESSMENT FRAMEWORK FOR COMPUTER SCIENCE GRADE-XI CURRICULUM 2022-23

INCLUSIVE SCHEME OF STUDIES - 2024

ACKNOWLEDGEMENT

It is a great honour that we, at the Federal Board of Intermediate and Secondary Education, have developed the Assessment Framework (AF) for the subject of Computer Science for Grade-XI. The primary objective of the AF is to optimize the current curriculum 2022-23. This comprehensive framework has been crafted meticulously by subject matter and assessment experts who conducted an in-depth review of all learning outcomes for Grade-XI Computer Science curriculum. They evaluated these outcomes in terms of their scope, cognitive level, and progression across the grade.

This significant undertaking was the result of a series of extensive meetings and collaborative efforts of the subject and assessment experts. Their dedication and expertise have been instrumental in bringing this framework to fruition.

The Assessment Framework will serve as a guiding document for students, teachers and paper setters. Students will receive clear directions for preparing themselves for the annual examination. Similarly, teachers will use it as a guide to understand what to teach in class and to prepare students for the final examinations accordingly. Similarly paper setters will also seek guidance from this document.

Following subject as well as assessment experts/committee members remained constantly engaged in the development of the AF:

1. Mrs. Rozina Faheem, Principal, F G College of Home Economic and Management Sciences, F-11/1 Islamabad
2. Mrs. Sadaf Zehra, Associate Professor, Islamabad Model College for Girls (PG), F-7/2, Islamabad
3. Mr. Waseem Aziz, Assistant Professor, Islamabad College for Boys, G-6/3, Islamabad

The whole work was successfully accomplished under the able supervision and guidance of Syed Junaid Akhlaq, Chairman, FBISE and due to the hard work and dedication of the staff of Research Section of FBISE, in particular, Syed Zulfiqar Shah, Deputy Secretary, Research and Academics who played a pivotal and leading role in finalizing the AF.

MIRZA ALI
Director (Research & Academics)
FBISE, Islamabad

ASSESSMENT FRAMEWORK FOR COMPUTER SCIENCE GRADE-XI, CURRICULUM 2022-23

To ensure clarity and precision in assessment, the learning outcomes have been categorized into two distinct groups: formative and summative. This classification helps in effectively measuring student progress and understanding. Each Student learning outcome (SLO) has been carefully marked as either formative or summative within the newly developed Assessment Framework. SLOs of Summative Assessment Format will be part of the Final Examination while SLOs of Formative Assessment will although be part of the teaching-learning activity but they will **NOT** be part of Final Examinations. Estimated cognitive levels i.e Knowledge (K), Understanding (U) and Application (A) of all the SLOs have also been indicated. It may be noted that all the higher cognitive levels have been collectively accumulated in the cognitive level of 'Application'. In subjects involving Practicals (Lab work), it has been mentioned categorically whether an SLO is summative for theory or summative for Practical Based Assessment (PBA). If an SLO is summative for PBA, it means that Laboratory work is required in the teaching-learning activity and it will be part of the Practical Examination/ Practical Based Assessment.

The Assessment Framework will act as a comprehensive guide for students, teachers and paper setters. Students will have clear instructions on how to prepare for the annual examinations. Teachers will use the framework to understand the curriculum and effectively prepare their students for the final examination. Additionally, paper setters will refer to this document for guidance in setting examination papers.

A model question paper has also been developed to provide a clear structure and format for upcoming examinations. The model question paper ensures consistency and fairness, offering students a comprehensive understanding of what to expect in their examinations. By aligning the paper with the Student Learning Outcomes (SLOs) of the curriculum, we ensured that the questions accurately reflect the skills and knowledge that students are expected to acquire.

A detailed Table of Specifications (ToS) has been created to ensure equitable coverage of cognitive levels and content domains in order to generate a balanced question paper. The ToS serves as drawing scale and action plan for the question paper, ensuring that all important areas of the curriculum are adequately and proportionately assessed.

FORMATIVE ASSESSMENT: AN ESSENTIAL COMPONENT OF EFFECTIVE LEARNING

Formative assessment is a pivotal element in the educational process, distinguished by its role in providing ongoing feedback to both students and educators. Unlike summative assessments, which evaluate student learning at the end of an instructional period, formative assessments are integrated into the learning process to monitor student understanding and guide instructional decisions.

The primary objective of formative assessment is to identify learning gaps and misunderstandings as they occur, enabling timely interventions. This dynamic approach allows teachers to adjust their teaching strategies to better meet the needs of their students. For instance, if a teacher notices through a quick quiz or class discussion that a significant portion of the class struggles with a particular concept, they can revisit that topic, providing additional explanations or alternative methods of instruction. This adaptability is crucial for fostering a deeper understanding of the material.

Formative assessments come in various forms, ranging from informal methods like classroom discussions, observations, and questioning, to more structured approaches such as quizzes, peer assessments, and self-reflections. These methods are not limited to paper-and-pencil tasks but can include digital tools that provide instant feedback. The versatility of formative assessments allows educators to cater to diverse learning styles and preferences, ensuring that all students are engaged and supported in their learning journey.

Formative assessment plays a significant role in creating a supportive classroom environment. It shifts the focus from merely achieving grades to understanding the learning process. This approach reduces the pressure on students, as they perceive assessments not as a final judgment of their abilities but as a part of their learning journey. Consequently, formative assessment can lead to increased student motivation and engagement.

In conclusion, formative assessment is a powerful tool that, when effectively implemented, can significantly enhance the learning experience. It provides invaluable insights for both teachers and students, promotes a growth-oriented learning environment, and supports the continuous development of essential skills. As education evolves, the role of formative assessment will undoubtedly continue to be central in fostering successful and meaningful learning experiences.

SUMMATIVE ASSESSMENT: EVALUATING LEARNING OUTCOMES IN THE FORM OF TERMINAL/FINAL EXAMINATION

Summative assessment is a fundamental component of the educational process, designed to evaluate student learning at the conclusion of an instructional period. Unlike formative assessment, which provides ongoing feedback during the learning process, summative assessment serves as a final measure of what students have learned. Typically administered at the end of a unit, course, or academic year. Summative assessment aims to determine the extent to which educational objectives have been achieved.

The primary purpose of summative assessment is to assess the overall effectiveness of instruction and learning. It provides a conclusive evaluation of student performance, often in the form of tests, final projects, or standardized exams. These assessments generate grades or scores that reflect a student's achievement in a given subject area over a specific period or time duration.

Summative assessment is often used to make critical decisions regarding student progression, certification, or placement in subsequent educational levels. Additionally, summative assessments provide valuable data that inform curriculum development and instructional strategies. By analyzing summative assessment results, educators can identify trends, strengths, and weaknesses within their instructional approaches, allowing for improvements in future teaching.

In conclusion, summative assessment plays a critical role in the educational process by providing a final evaluation of student learning. While it differs from formative assessment in its focus and application, it is an essential tool for measuring academic achievement. When balanced with formative assessments, summative assessments contribute to a well-rounded and effective approach to evaluating and supporting student learning.

National Curriculum of Pakistan 2022-23
Assessment Framework
COMPUTER SCIENCE Grade-XI (HSSC-I)
Details of Content Areas/ SLOs

| Content Domain/ Area | SLO No./ Description | Form of Assessment | Cognitive Level (Knowledge, Understanding, Application) | Remarks | Number of Periods required (1 period= 40 minutes) |
|-------------------------|---|---|---|---|---|
| A: Computer Systems | <p>[SLO CS-11-A-01] Students will be able to understand and apply logic gates in digital systems, define and create truth tables using Boolean operators like AND, OR, NOT, NAND, XOR) and logic diagrams.</p> <p>Students will understand...</p> <ul style="list-style-type: none"> • Boolean functions • Boolean expressions • Boolean identities • Duality • What is digital logic • What makes analog and digital signals different • What are logic gates • What are truth tables • What are switches <p>Students will be able to</p> <ul style="list-style-type: none"> • Construct Boolean functions, expressions, and identities. • Recognize duality • Identify different logic gates and explain their uses • Create truth tables for expressions up to 3 inputs • Draw logic gates for a Boolean expression • Draw a truth table for a logic gate to identify the outputs <p>Student will know</p> | Summative for Theory and Practical Based Assessment | Knowledge / Understanding/ Application | Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment | 30 |

| Content Domain/ Area | SLO No./ Description | Form of Assessment | Cognitive Level (Knowledge, Understanding, Application) | Remarks | Number of Periods required (1 period= 40 minutes) |
|-------------------------|---|----------------------|---|--|---|
| | <ul style="list-style-type: none"> Key terms: Karnaugh maps, AND, OR, NOT, NAND gates, XOR How to create truth tables How to identify logic gates and understand their usage | | | | |
| | <p>[SLO CS-11-A-02] Students will be able to understand and evaluate stages of the systems design, e.g. software development life cycle (analysis, design, coding, and testing etc.), and software development methodologies.</p> <p>Students will understand that</p> <ul style="list-style-type: none"> What is a Software Development Life Cycle(SDLC) <ul style="list-style-type: none"> What are the different activities involved in each phase of the SDLC (Advanced) What are basic software processes and Agile, Water fall software process models <p>Students will know</p> <ul style="list-style-type: none"> Key terms: SDLC, bug, Agile, Waterfall, debugging, testing, design patterns, UML. Key activities in software development and the role of software development processes The engineering nature of software development Key concepts in software development such as risk and quality <p>Students will be able to</p> <ul style="list-style-type: none"> Relate the different stages of SDLC(analysis, design, coding, testing etc.) to a case study Plan a software project from beginning (design) to end(test and launch) (Advanced)Explain common software development processes(agile etc.) Explain black box and white box testing | Summative for Theory | Knowledge / Understanding | Question(s) will be asked in the Annual theory paper | |

| Content Domain/ Area | SLO No./ Description | Form of Assessment | Cognitive Level (Knowledge, Understanding, Application) | Remarks | Number of Periods required (1 period= 40 minutes) |
|----------------------|---|----------------------|---|--|---|
| | <p>[SLO CS-11-A-03] Students will be able to understand and explain the scalability and reliability of networking systems via network topology</p> <p>Students will understand...</p> <ul style="list-style-type: none"> • Different types of network topologies • Design, common access, and use of topologies • Scalability and reliability • Preparing for scale and reliability through load and system testing • Scalability and reliability in cloud computing <p>Students will know</p> <ul style="list-style-type: none"> • Key terms: Network topology, Bus, Ring, Tree, Star, Mesh, Hybrid, Ethernet, CSMA, Token passing, client, Server, root, node... • Advantages and disadvantages of each network topology <p>Students will be able to</p> <ul style="list-style-type: none"> • Measure availability of a system • Prepare systems so they run with high reliability and can scale well • Test the scalability and reliability of a system | Summative for Theory | Knowledge / Understanding | Question(s) will be asked in the Annual theory paper | |
| | <p>[SLO CS-11-A-04] Understand and explain the need for cyber security and contrast different methods of encryption to transmit data.</p> <p>Students will understand...</p> <ul style="list-style-type: none"> • Cybersecurity • Encryption • Ways a system can be attacked • Basic security frameworks • Security analysis and proactive protection of systems against cyberattacks • Data policies and privacy policies and how they can help keep your information safe | Summative for Theory | Knowledge / Understanding | Question(s) will be asked in the Annual theory paper | |

| Content Domain/ Area | SLO No./ Description | Form of Assessment | Cognitive Level (Knowledge, Understanding, Application) | Remarks | Number of Periods required (1 period= 40 minutes) |
|---|---|---|---|---|---|
| | <p>Students will know</p> <ul style="list-style-type: none"> Key terms: Cryptography, 2FA, firewall, DDoS, Hacking, Authentication, Authorization, Hashing, Malware, Phishing, XSS, Plaintext, Ciphertext, Encryption, Decryption.... <p>Students will be able to</p> <ul style="list-style-type: none"> Protect their computers and setup online access taking into account the security risks they are prone to Understand how basic cyberattacks are constructed and applies to real systems Analyze cyber security risk and create a plan to prioritize risk decisions Understand basic encryption techniques and algorithms used to protect sensitive data How to protect sensitive apps and data through strong passwords, 2 factor authentication and encryption techniques. | | | | |
| B: Computational Thinking and Algorithms | <p>[SLO CS-11-B-01] Plan, develop, systematically test, and refine computational artifacts for problem-solving such as pseudocode, etc.</p> <p>Students will understand</p> <ul style="list-style-type: none"> How to use different methods to design and construct a solution to a computational problem <p>Students will be able to</p> <ul style="list-style-type: none"> Create pseudocode to address computational problems in the correct font, size, style, indentation, case, line numbers, comments, data type keywords, variable assignments & declarations, common operators, and key commands Systematically test computational artifacts Analyse an algorithm presented as a flow chart in terms of include tracing an algorithm as well as assessing its correctness. | Summative for Theory and Practical Based Assessment | Knowledge / Understanding/ Application | Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment | 20 |

| Content Domain/ Area | SLO No./ Description | Form of Assessment | Cognitive Level (Knowledge, Understanding, Application) | Remarks | Number of Periods required (1 period= 40 minutes) |
|----------------------------|---|---|---|---|---|
| | <ul style="list-style-type: none"> Evaluate algorithms in terms of their efficiency, correctness, and clarity | | | | |
| | <p>[SLO CS-11-B-02]Apply common search, and sort algorithms</p> <p>Students will understand</p> <ul style="list-style-type: none"> Problem solving methods using simple example of <ol style="list-style-type: none"> Abstraction Decomposition Pattern recognition Algorithmic approaches to solve practical exercises of algorithms When to use various search and sort algorithms such as linear search, binary search, insertion sort, bubble sort, etc. <p>Students will be able to</p> <ul style="list-style-type: none"> Use and adapt classic algorithms to solve computational problems (e.g. sorting and searching algorithms such as linear search, binary search, insertion sort, bubble sort, etc.) | Summative for Theory and Practical Based Assessment | Knowledge / Understanding/ Application | Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment | |
| C: Programing Fundamentals | <p>[SLO CS-11-C-01] Students should understand the importance of computer programming and applications</p> <p>Students will understand...</p> <ul style="list-style-type: none"> Programs use the basic components of a computer to take inputs, process the input, and produce output The Agile and Waterfall are models of the Software Development Life cycle and are used to gather requirements and implement software <p>Students will be able to...</p> <ul style="list-style-type: none"> Take a real-world problem, propose a software solution, and implement it. | Summative for Theory and Practical Based Assessment | Knowledge / Understanding/ Application | Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment | 40 |

| Content Domain/ Area | SLO No./ Description | Form of Assessment | Cognitive Level (Knowledge, Understanding, Application) | Remarks | Number of Periods required (1 period= 40 minutes) |
|----------------------|---|---|---|---|---|
| | <p>[SLO CS-11-C-02] Students should be able to write and execute simple programs in Python.</p> <p>Students will understand...</p> <ul style="list-style-type: none"> • What is Python, why is it used • What type of problems can be solved using Python • Input/Output handling • Variables in Python • Operators in Python • Sequence, Selection, Repetition in Python <p>Students will be able to...</p> <ul style="list-style-type: none"> • Write and execute a program in Python using an IDE like replit.com (online) VS Code(offline) that uses variables, sequence, selection, and repetition | Summative for Theory and Practical Based Assessment | Knowledge / Understanding/ Application | Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment | |
| | <p>[SLO CS-11-C-03] Students should be able to draw shapes using Turtle Graphics functions in Python</p> <p>Students will understand...</p> <ul style="list-style-type: none"> • How to use the Python Turtle Library <ul style="list-style-type: none"> ○ Turtle methods ○ Methods of screen ○ Turtle motion ○ Use of events ○ Create/draw shapes ○ Compound Shapes • How to create shapes by means of instructions to a “turtle” to move in a given direction • How to create more complex shapes by allowing the “turtle” to lift the pen while moving <p>Students will be able to...</p> | Summative for Theory and Practical Based Assessment | Knowledge / Understanding/ Application | Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment | |

| Content Domain/ Area | SLO No./ Description | Form of Assessment | Cognitive Level (Knowledge, Understanding, Application) | Remarks | Number of Periods required (1 period= 40 minutes) |
|-------------------------|--|---|---|---|---|
| | <ul style="list-style-type: none"> Write and execute a program in Python to create complex shapes using the Turtle library | | | | |
| | <p>[SLO CS-11-C-04]Students should be able to understand the need for libraries and learn the use of some simple libraries in Python.</p> <p>Students will understand...</p> <ul style="list-style-type: none"> The concept of abstraction allows the use of complex libraries without knowing their internal implementation <p>Students will be able to...</p> <ul style="list-style-type: none"> Find and use a third-party Python library that is simple to use but has a complex implementation | Summative for Theory and Practical Based Assessment | Knowledge / Understanding/ Application | Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment | |
| | <p>[SLO CS-11-C-05] Students should be able to translate simple algorithms that use sequence and repetition in Python.</p> <p>Students will understand...</p> <ul style="list-style-type: none"> What are variables, sequence, repetition, and lists in Python How to use sequence and repetition to manipulate lists in Python <p>Students will be able to...</p> <ul style="list-style-type: none"> Write and execute a Python program that uses variables, sequence, and repetition to populate a list Write and execute a Python program that uses variables, sequence, and repetition to find an element in a list | Summative for Theory and Practical Based Assessment | Knowledge / Understanding/ Application | Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment | |
| | <p>[SLO CS-11-C-06] Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python</p> <p>Students will understand...</p> <ul style="list-style-type: none"> Why we need functions How to decompose a large problem into sub-problems How to identify duplication in their code | Summative for Theory and Practical Based Assessment | Knowledge / Understanding/ Application | Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment | |

| Content Domain/ Area | SLO No./ Description | Form of Assessment | Cognitive Level (Knowledge, Understanding, Application) | Remarks | Number of Periods required (1 period= 40 minutes) |
|-------------------------|---|---|---|---|---|
| | <ul style="list-style-type: none"> How to move duplicated code into a function How to create/define/invoke a function Types of Functions Function parameters/arguments Scope of variables Returning value from a function Pass by value <p>Students will be able to...</p> <ul style="list-style-type: none"> Write and execute a Python program that solves a large problem by decomposing into subproblems Write a Python program that invokes functions within loops Write a Python program that performs some mathematical operation on a value passed to it, and returns the updated value (for example Celsius to Fahrenheit conversion etc.) | | | | |
| | <p>[SLO CS-11-C-07] Students will determine ways of debugging their code in Python</p> <p>Students will understand...</p> <ul style="list-style-type: none"> Code written outside of a function is hard to test Code written inside a function can be tested That they can write code that calls functions to ensure the results are correct Using a debugger allows programmers to set a breakpoint to stop execution of their code to see the state of variables mid-execution for the purpose of discovering errors in their code <p>Students will be able to...</p> <ul style="list-style-type: none"> Write code to invoke functions and check their return values for correctness Read through code and dry run by hand to find bugs | Summative for Theory and Practical Based Assessment | Knowledge / Understanding/ Application | Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment | |

| Content Domain/ Area | SLO No./ Description | Form of Assessment | Cognitive Level (Knowledge, Understanding, Application) | Remarks | Number of Periods required (1 period= 40 minutes) |
|-------------------------|---|---|---|---|---|
| D: Data and Analysis | <p>[SLO CS-11-D-01] Students will be able to relate the role and importance of model building with their real-world applications</p> <p>Students will know how statistical modeling can find relationships between real world events and can be used to make recommendations based on statistical findings. They will know use cases for modeling, when they can be used, which models fit which use cases and basic statistical techniques such as linear regression and multiple linear regression. Students will know:</p> <ul style="list-style-type: none"> • The linear relationship between variables (using correlation coefficients and build the $y = mx + c$ using slope and intercept) • The structure of linear models, K-means, Smoothing <p>Students will be able to:</p> <ul style="list-style-type: none"> • Use the information from one variable to make predictions about another variable (fitting a line to understand the relationship between two variables and use the correlation coefficient to access the linear association) • Identify the slope and intercept for the linear relationship • Build their first statistical model (Microsoft Excel Python, Weka, or Microsoft Excel) • (Advanced) Interpret the results of the model including statistical significance and beta values • (Advanced) Draw conclusions from the model output to inform real world policies | Summative for Theory and Practical Based Assessment | Knowledge / Understanding/ Application | Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment | 25 |
| | <p>[SLO CS-11-D-02] Students will understand and explain experimental design in data science</p> <p>Students will understand</p> | Summative for Theory and Practical | Knowledge / Understanding/ Application | Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the | |

| Content Domain/ Area | SLO No./ Description | Form of Assessment | Cognitive Level (Knowledge, Understanding, Application) | Remarks | Number of Periods required (1 period= 40 minutes) |
|----------------------|--|---|---|--|---|
| | <ul style="list-style-type: none"> The importance of experimentation in data science as a tool to differentiate between correlation and causation Measures used in experimentation Real work experimentation examples <p>Student will know...</p> <ul style="list-style-type: none"> Data collection methods, including traditional methods of designed experiments and observational studies and surveys Statistics as a process for making inferences about population parameters based on a random sample from that population <p>Students will be able to</p> <ul style="list-style-type: none"> Differentiate between correlation and causation Compare and contrast population vs. sample Compare and contrast parameter vs. statistic How to do their own experiments through in-class activities Apply a real-world business problem where experimentation is used.(e.g. Facebook, YouTube, on line retail) Explain situations where one measure of central tendency or spread may be more appropriate than others (Advanced) Identify reports that use special data structures (census, survey, observational study, and randomized experiment) (Advanced) Use RStudio/python to re-randomize data (Advanced) Compute measures of central tendency and spread in RStudio/python | Based Assessment | | Practical Based Assessment | |
| | <p>[SLO CS-11-D-03] Students will analyze pre-existing data sets to create summary statistics and data visuals (such as bar charts, pie charts, line graphs, etc.)</p> <p>Students will understand</p> | Summative for Theory and Practical Based Assessment | Knowledge / Understanding/ Application | Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the | |

| Content Domain/ Area | SLO No./ Description | Form of Assessment | Cognitive Level (Knowledge, Understanding, Application) | Remarks | Number of Periods required (1 period= 40 minutes) |
|----------------------|---|--------------------|---|----------------------------|---|
| | <ul style="list-style-type: none"> Definitions and analysis of data and data products (charts, graphs, statistics) How to construct multiple views of data How to use analyze data through computational tools such as Excel, Google Sheets, R, or Python <p>Students will</p> <ul style="list-style-type: none"> Apply their knowledge of visualization techniques (such as measures of center and spread, boxplots, bar plots , histograms, scatterplots) to data Read plots (identify the name of the plot, interpret the axes, look for trends, identify confounding factors) Use visualization to tell stories with data (Advanced) Create basic plots in RStudio (Advanced) Create frequency tables in RStudio (Advanced) Critically read reports from media sources to evaluate their claims and communicate their evaluations in written or verbal form using different types of media <p>Students will be able to...</p> <ul style="list-style-type: none"> Collect, clean, and manipulate data using tools such as Excel, Google Sheets, R, or Python Analyze data using statistical techniques and create visualizations to communicate their findings Understand the connection of databases to machine learning (Advanced) Understand how evidence was collected, what the perspective or bias of the creator might be and look behind the scenes to the process used to create the product. Even the way data are represented embeds within it decisions on the part of the data creator | | | Practical Based Assessment | |

| Content Domain/ Area | SLO No./ Description | Form of Assessment | Cognitive Level (Knowledge, Understanding, Application) | Remarks | Number of Periods required (1 period= 40 minutes) |
|-------------------------------------|---|----------------------|---|--|---|
| E: Applications of Computer Science | <p>[SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain</p> <p>Students will understand...</p> <ul style="list-style-type: none"> • Advancement in technologies like smaller size, higher processing power, longer battery power, AI techniques, cloud computing, and connectivity have enabled IoT applications • Network connectivity, Processing power, and Cryptography are technologies that enable blockchains <p>Students will be able to...</p> <ul style="list-style-type: none"> • Analyze technologies that have enabled IoT and blockchain applications | Summative for Theory | Knowledge / Understanding | Question(s) will be asked in the Annual theory paper | 15 |
| | <p>[SLO CS-11-E-02] Students should be able to evaluate how different stakeholder's culture, values, and (sometimes conflicting) interests affect AI System designs</p> <p>Students will understand...</p> <ul style="list-style-type: none"> • That there are different stakeholders that have vested interest in the outcomes of an AI algorithm • These different stakeholders might have conflicting requirements for these algorithms <p>Students will be able to...</p> <ul style="list-style-type: none"> • Explore some of the stakeholders and describe their interest in AI algorithms • Assess policies that can help protect different stakeholders' interests • Evaluate how different stakeholder's culture, values, and (sometimes conflicting) interests affect AI System designs | Summative for Theory | Knowledge / Understanding | Question(s) will be asked in the Annual theory paper | |
| F: Impacts of | [SLO CS-11-F-01] Understand and apply safe & responsible use of information sources, identifying sources of reliable information compared to unreliable information and its sources | Summative for Theory | Knowledge / Understanding | Question(s) will be asked in the Annual theory paper | 15 |

| Content Domain/ Area | SLO No./ Description | Form of Assessment | Cognitive Level (Knowledge, Understanding, Application) | Remarks | Number of Periods required (1 period= 40 minutes) |
|----------------------|--|----------------------|---|--|---|
| Computing | <p>Students will understand...</p> <ul style="list-style-type: none"> Safe & responsible use of information sources Human bias is everywhere including data collection and information sharing <p>Students will know...</p> <ul style="list-style-type: none"> The difference between data source verification tasks that should be completed by humans and those that are ideally completed by computing devices <p>Students will be able to...</p> <ul style="list-style-type: none"> Identify sources of reliable and unreliable information Address issues of bias in the designs of their computing applications Conduct data searches to obtain reliable information | | | | |
| | <p>[SLO CS-11-F-02] Define and discuss how computing has increased connectivity by enabling communication between people and the environmental, cultural, and human impact of increased connectivity</p> <p>Students will understand...</p> <ul style="list-style-type: none"> The uses of assistive technologies for people with disabilities and the elderly The impact of the digital divide on connectivity and how accessibility to information affects the lives of different people <p>Students will know...</p> <ul style="list-style-type: none"> The different technological innovations we are using to improve communication between people such as Wi-Fi networks, Bluetooth etc. <p>Students will be able to...</p> <ul style="list-style-type: none"> Discuss the impact of computing technology on business and commerce Collaborate on strategies to provide equity and equal access to information | Summative for Theory | Knowledge / Understanding | Question(s) will be asked in the Annual theory paper | |

| Content Domain/ Area | SLO No./ Description | Form of Assessment | Cognitive Level (Knowledge, Understanding, Application) | Remarks | Number of Periods required (1 period= 40 minutes) |
|--|---|---|---|---|---|
| | <ul style="list-style-type: none"> (Advanced) Distinguish between impact of tasks that are ideally completed by humans and those that are ideally completed by computing devices | | | | |
| G: Digital Literacy | <p>[SLO CS-11-G-01] Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations)</p> <p>Students will understand...</p> <ul style="list-style-type: none"> Definitions of data collection strategies (e.g. qualitative interviews, surveys, prototypes, simulations) Best practices on how to present primary & secondary data for a research question How to design data-collection approach to gather original data <p>Students will know...</p> <ul style="list-style-type: none"> How to use appropriate data collection strategies for various types of research questions <p>Students will be able to...</p> <ul style="list-style-type: none"> Design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations) Present data using appropriate digital tools (such as graphs or infographics in worksheets, presentations, reports etc.) | Summative for Theory and Practical Based Assessment | Knowledge / Understanding/ Application | Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment | 10 |
| H: Entrepreneurship in the digital age | <p>[SLO EN-11-H-01] Students will create, test, and iterate a prototype for a business idea</p> <p>Students will understand...</p> <ul style="list-style-type: none"> What is prototyping and why is it important How to design and test a prototype <p>Students will be able to...</p> <ul style="list-style-type: none"> Design, build and test the prototype | Summative for Theory and Practical Based Assessment | Knowledge / Understanding/ Application | Question(s) will be asked in the Annual theory paper as well as Lab work will be assessed in the Practical Based Assessment | 10 |

| Content Domain/ Area | SLO No./ Description | Form of Assessment | Cognitive Level (Knowledge, Understanding, Application) | Remarks | Number of Periods required (1 period= 40 minutes) |
|-------------------------------------|---|-------------------------------|--|----------------|--|
| | <ul style="list-style-type: none">• Derive learnings from prototype testing• Iterate business solution based on prototype test results | | | | |



Federal Board HSSC-I Examination

Computer Science Model Question Paper

Curriculum 2022-2023 (Inclusive Scheme of Studies 2024)

Section - A (Marks 17)

Time Allowed: 25 minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent.
Deleting/overwriting is not allowed. Do not use lead pencil.

| ROLL NUMBER | | | | | |
|-------------|---|---|---|---|---|
| | | | | | |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 2 | 2 | 2 | 2 | 2 |
| 3 | 3 | 3 | 3 | 3 | 3 |
| 4 | 4 | 4 | 4 | 4 | 4 |
| 5 | 5 | 5 | 5 | 5 | 5 |
| 6 | 6 | 6 | 6 | 6 | 6 |
| 7 | 7 | 7 | 7 | 7 | 7 |
| 8 | 8 | 8 | 8 | 8 | 8 |
| 9 | 9 | 9 | 9 | 9 | 9 |

| Version No. | | | |
|-------------|---|---|---|
| | | | |
| 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 |
| 2 | 2 | 2 | 2 |
| 3 | 3 | 3 | 3 |
| 4 | 4 | 4 | 4 |
| 5 | 5 | 5 | 5 |
| 6 | 6 | 6 | 6 |
| 7 | 7 | 7 | 7 |
| 8 | 8 | 8 | 8 |
| 9 | 9 | 9 | 9 |

Candidate Sign. _____

Invigilator Sign. _____

Q1. Fill the relevant bubble against each question according to curriculum. Each part carries one mark.

| Sr no. | Question | A | B | C | D | A | B | C | D |
|--------|---|--|---|---|---|-----------------------|-----------------------|-----------------------|-----------------------|
| i. | What is the primary purpose of using histogram in data analysis? | To show the relationship between two variables | To display the distribution of a single variable | To summarize the mean and standard deviation of data | To compare categorical data | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ii. | Which computational thinking process involves removing unnecessary details to focus on the essential parts? | Decomposition | Pattern Recognition | Abstraction | Algorithm Design | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| iii. | Which of the following is a method used to prevent unauthorized access to a network? | Worm | Virus | Firewall | Spyware | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| iv. | Which of the following tasks best demonstrates black box testing? | Reviewing the source code to find syntax errors | Using debugging tools, trace function calls | Type login details and click button to go to the dashboard | Testing how fast a function runs internally | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| v. | Which of the following is an example of practicing good digital citizenship? | Engaging in respectful online communication | Sharing sensitive information without permission | Plagiarizing content from the internet | Ignoring copyright laws | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| vi. | Which of the following symbols is used to identify single line comment in Python? | // | # | /* | >> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| vii. | Which of the following is an example of an efficient algorithm? | An algorithm that finds an item in a list of 1000 items by checking each one | An algorithm that prints all the numbers from 1 to 1000 | An algorithm that finds an item in a sorted list of 1000 items by dividing the list in half each time | An algorithm that repeats the same task multiple times without any change | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

| | | | | | | |
|-------|--|---|---|--|---|---|
| viii. | To build a school management system, a software company asks principals about their needs. What data collection method is being used? | Simulation | Interview | Prototyping | Survey | <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |
| ix. | In the field of artificial intelligence, which subfield focuses on enabling machines to understand and interpret human language? | Computer Vision | Robotics | Machine Learning | Natural Language Processing | <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |
| x. | Which of the following statements best describes the role of digital entrepreneurship? | It focuses solely on traditional business models without incorporating digital technologies | It relies on manual processes and paperwork for business operations | It avoids online marketing and sales channels | It leverages digital technologies to create innovative products, services, or business models | <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |
| xi. | Which of the following is a significant environmental concern associated with the growth of data centers? | Lower water consumption | Decreased electronic waste | Higher carbon emissions due to energy consumption | Increased paper waste | <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |
| xii. | What will be the output of the following statement? for i in range(5): print(i) | 0 1 2 3 4 5 | 0 1 2 3 4 | 1 2 3 4 5 | Error in statement | <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |
| xiii. | Which of the following digital tools is commonly used for market research and analysis in digital entrepreneurship? | Social media platforms | Email clients | Spreadsheet software | Fax machines | <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |
| xiv. | Which of the following is an example of a statistic? | The average age of 50 randomly selected employees in company | The average height of all students in a country | The true proportion of voters supporting a candidate | The average income of every citizen in a state | <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |
| xv. | A hospital is considering new software to manage patient records. However, the cost of development is higher than the budget allocated and expected financial benefits. Which feasibility concern arises here? | Operational feasibility | Technical feasibility | Economic feasibility | Legal feasibility | <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |
| xvi. | Which of these behaviors shows a student is practicing digital responsibility? | Cross-checking facts from reliable sources before using them | Sharing an unverified news story because it sounds shocking | Ignoring copyrights and using any image found online | Clicking on every promotion that looks interesting | <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |
| xvii. | A data analyst wants to predict the price of a house based on its area (in square feet). Which type of machine learning algorithm is most suitable for this task? | Linear regression | Association | Classification | Clustering | <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |



Federal Board HSSC-I Examination

Computer Science Model Question Paper

Curriculum 2022-2023 (Inclusive Scheme of Studies 2024)

Time allowed: 2.35 hours

Total Marks: 63

Note: Answer all parts from Section ‘B’ and all questions from Section ‘C’ on the **E-sheet**.
Write your answers on the allotted/given spaces.

SECTION – B (Marks 39)

Q.2 Attempt the following questions.

(13x3 = 39)

| Q# | Question | Marks | Question | | Marks | | | | | | | | |
|--|---|-------|-----------|--|-------------------|---------------------|--|--|--|--|--|--|---|
| i. | Correct the following Python code segments by removing errors: | 3 | OR | Given the following pseudocode: | 3 | | | | | | | | |
| | <table><tr><td>Incorrect code</td><td>Code without errors</td></tr><tr><td>num1 = 10 num2 = "5" result = num1 + num2 print(result)</td><td></td></tr><tr><td>fruits = ["Islamabad", "Karachi", "Lahore"] print(fruits [3])</td><td></td></tr><tr><td>num1 = 10 num2 = 0 result = num1 / num2 print(result)</td><td></td></tr></table> | | | Incorrect code | | Code without errors | num1 = 10 num2 = "5" result = num1 + num2 print(result) | | fruits = ["Islamabad", "Karachi", "Lahore"] print(fruits [3]) | | num1 = 10 num2 = 0 result = num1 / num2 print(result) | | Step 1: Initialize a variable sum with 0 Step 2: Initialize a variable i with 2 Step 3: While i is less than or equal to N Step 4: Add i to sum Step 5: Increment i by 2 Step 6: Print sum Modify the pseudocode to print the product of odd numbers from 1-30. |
| | Incorrect code | | | Code without errors | | | | | | | | | |
| | num1 = 10 num2 = "5" result = num1 + num2 print(result) | | | | | | | | | | | | |
| | fruits = ["Islamabad", "Karachi", "Lahore"] print(fruits [3]) | | | | | | | | | | | | |
| num1 = 10 num2 = 0 result = num1 / num2 print(result) | | | | | | | | | | | | | |
| ii. | What is slope and intercept for the linear relationship? Give example from daily life. | 3 | OR | Briefly explain any three types of cloud computing models. | 3 | | | | | | | | |
| iii. | A city healthcare provider is in the process of upgrading its software to improve patient care and enhance data security. Using this case study, recommend the most suitable implementation method of SDLC. Justify your recommendation by outlining any two considerations. | 1+2 | OR | Differentiate between supervised and unsupervised learning with daily life example. | 3 | | | | | | | | |
| iv. | Why is prototyping important? Give three reasons. | 3 | OR | Compare star and ring topologies with respect to scalability, reliability, and architecture. | 3 | | | | | | | | |
| v. | Compare local and global variable with example. | 2 | OR | Consider the following examples of scenarios and identify whether the waterfall or agile model would be the most suitable for development. a. Building construction b. Developing web application c. Digital marketing campaign d. Automobile production e. Public works projects f. Research projects | 0.5x 6 | | | | | | | | |
| vi. | What is an assistive technology? Also write down its two uses in daily life. | 1+2 | OR | Write down any three positive impacts of AI systems. | 3 | | | | | | | | |
| vii. | Categorize the following scenarios by identifying whether the linear or binary search algorithms is more appropriate choice. Also justify your answer. | 3 | OR | What will be displayed after executing the following statements? | 3 | | | | | | | | |
| | | | | <table><tr><td>Python Statements</td><td>Output</td></tr></table> | Python Statements | Output | | | | | | | |
| Python Statements | Output | | | | | | | | | | | | |

| | <table><tr><th>Scenario</th><th>Search algorithm</th><th>Reason</th></tr><tr><td>Bounded data ranges</td><td></td><td></td></tr><tr><td>Small data sets</td><td></td><td></td></tr><tr><td>Large, sorted data sets</td><td></td><td></td></tr></table> | Scenario | Search algorithm | Reason | Bounded data ranges | | | Small data sets | | | Large, sorted data sets | | | | | <table><tr><td>x = ["apple", "banana", "mango"] print(type(x))</td><td></td></tr><tr><td>x = "Hello World" print(type(x))</td><td></td></tr><tr><td>x = 20.5 print(type(x))</td><td></td></tr></table> a. | x = ["apple", "banana", "mango"] print(type(x)) | | x = "Hello World" print(type(x)) | | x = 20.5 print(type(x)) | | |
|--|--|----------|------------------|--|---------------------|--|--|-----------------|--|--|-------------------------|--|--|--|--|---|--|--|-------------------------------------|--|----------------------------|--|--|
| Scenario | Search algorithm | Reason | | | | | | | | | | | | | | | | | | | | | |
| Bounded data ranges | | | | | | | | | | | | | | | | | | | | | | | |
| Small data sets | | | | | | | | | | | | | | | | | | | | | | | |
| Large, sorted data sets | | | | | | | | | | | | | | | | | | | | | | | |
| x = ["apple", "banana", "mango"] print(type(x)) | | | | | | | | | | | | | | | | | | | | | | | |
| x = "Hello World" print(type(x)) | | | | | | | | | | | | | | | | | | | | | | | |
| x = 20.5 print(type(x)) | | | | | | | | | | | | | | | | | | | | | | | |
| viii. | Evaluate the following expression using the correct order of operations in Python: (2 + 3 ** 2 + 4 // 2 * 5 % 3 - 1) * 2 | 3 | OR | Draw OR and NAND gates with their truth table. | 1.5+ 1.5 | | | | | | | | | | | | | | | | | | |
| ix. | Write down three advantages of infographics. | 3 | OR | List down any three tools to create a prototype. | 3 | | | | | | | | | | | | | | | | | | |
| x. | Convert the following Boolean expression to the logic circuit: F = XYZ + X̄YZ + X̄Z | 3 | OR | Write a Python program that takes an alphabet as input and prints whether it is a vowel or a consonant. | 3 | | | | | | | | | | | | | | | | | | |
| xi. | What are the common applications of simulation that benefit everyday activities? (Provide any three applications) | 3 | OR | What is the impact of the digital divide on connectivity? What strategies should be taken to bridge the digital divide? (Give any two) | 1+2 | | | | | | | | | | | | | | | | | | |
| xii. | How are logic gates useful in daily life? Give any three applications. | 3 | OR | What is the difference between correlation and causation? Illustrate with example. | 3 | | | | | | | | | | | | | | | | | | |
| xiii. | Complete the following Python code that exits when x is "Physics". subjects = ["Computer", "English", "Physics"] for x in _____: if x == _____: _____ print(x) | 3 | OR | Write a Python function find_max() that takes two numbers as input and returns the maximum number. | 3 | | | | | | | | | | | | | | | | | | |

SECTION – C (Marks 24)

Note: Attempt all questions. Marks of each question are equal.

(4 x 6=24)

| Q. No. | Question | Marks | Question | | Marks | | | | | | | | |
|--------|---|-------|----------|--|-------|----|---|----|---|---|----|---|---|
| Q.3 | <p>Simplify the Boolean Function F, using Karnaugh Map.</p> <p>$F = \overline{A}\overline{B}\overline{C} + \overline{A}B\overline{C} + A\overline{B}\overline{C} + A\overline{B}C + A\overline{B}\overline{C} + ABC$</p> <p>Also construct a logic circuit for simplified expression.</p> | 3+3 | OR | Write a Python program to compute the area of circle and rectangle by using function. | 6 | | | | | | | | |
| Q.4 | What are data collection methods? Contrast any two data collection methods with respect to strength, weakness, reliability, cost and validity. | 1+5 | OR | What is encryption? Compare Symmetric and Asymmetric encryption with respect to efficiency, security, ease of implementation, key length, and large data handling. | 1+5 | | | | | | | | |
| Q.5 | <p>Sort the following numbers in ascending order using Bubble sort algorithm:</p> <table border="1"><tr><td>10</td><td>9</td><td>26</td><td>4</td><td>1</td><td>8</td><td>37</td><td>5</td></tr></table> | 10 | 9 | 26 | 4 | 1 | 8 | 37 | 5 | 6 | OR | Write a Python program to count even and odd numbers in a list by using while loop. | 6 |
| 10 | 9 | 26 | 4 | 1 | 8 | 37 | 5 | | | | | | |
| Q.6 | What is the importance of blockchain technology? Explain any two technologies that enabled blockchain. | 2+4 | OR | What is a reliable information source? Explain any four sources of reliable information. | 2+4 | | | | | | | | |

Federal Board HSSC-I Examination
Computer Science Model Question Paper

(Curriculum 2022-23)

Alignment of Questions with Student Learning Outcomes

| Sr No | Section: Q. No. (Part no.) | Content Domain / Area | Student Learning Outcomes | Cognitive Level * | Allocated Marks in Model Paper |
|-------|----------------------------|-----------------------|--|-------------------|--------------------------------|
| 1 | A: Q1(i) | Domain D | [SLO CS-11-D-03] Students will analyze pre-existing data sets to create summary statistics and data visuals (such as bar charts, pie charts, line graphs, etc.) | K | 1 |
| 2 | A: Q1(ii) | Domain B | [SLO CS-11-B-02] Apply common search, and sort algorithms | K | 1 |
| 3 | A: Q1(iii) | Domain A | [SLO CS-11-A-04] Understand and explain the need for cyber security and contrast different methods of encryption to transmit data. | K | 1 |
| 4 | A: Q1(iv) | Domain A | [SLO CS-11-A-02] Students will be able to understand and evaluate stages of the systems design, e.g. software development life cycle (analysis, design, coding, and testing etc.), and software development methodologies. | U | 1 |
| 5 | A: Q1(v) | Domain G | [SLO CS-11-G-01] Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations) | U | 1 |
| 6 | A: Q1(vi) | Domain C | [SLO CS-11-C-02] Students should be able to write and execute simple programs in Python. | K | 1 |
| 7 | A: Q1(vii) | Domain B | [SLO CS-11-B-01] Plan, develop, systematically test, and refine computational artifacts for problem-solving such as pseudocode, etc. | U | 1 |
| 8 | A: Q1(viii) | Domain G | [SLO CS-11-G-01] Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations) | U | 1 |
| 9 | A: Q1(ix) | Domain E | [SLO CS-11-E-02] Students should be able to evaluate how different stakeholder's culture, values, and (sometimes conflicting) interests affect AI System designs | K | 1 |
| 10 | A: Q1(x) | Domain H | [SLO EN-11-H-01] Students will create, test, and iterate a prototype for a business idea | U | 1 |
| 11 | A: Q1(xi) | Domain F | [SLO CS-11-F-02] Define and discuss how computing has increased connectivity by enabling communication between people and the environmental, cultural, and human impact of increased connectivity | U | 1 |
| 12 | A: Q1(xii) | Domain C | [SLO CS-11-C-05] Students should be able to translate simple algorithms that use sequence and repetition in Python. | U | 1 |
| 13 | A: Q1(xiii) | Domain H | [SLO EN-11-H-01] Students will create, test, and iterate a prototype for a business idea | U | 1 |

| | | | | | | | |
|-----------------|-------------|----------|--|--|--|---|---|
| 14 | A: Q1(xiv) | Domain D | [SLO CS-11-D-02] Students will understand and explain experimental design in data science | | | U | 1 |
| 15 | A: Q1(xv) | Domain A | [SLO CS-11-A-02] Students will be able to understand and evaluate stages of the systems design, e.g. software development life cycle (analysis, design, coding, and testing etc.), and software development methodologies. | | | U | 1 |
| 16 | A: Q1(xvi) | Domain F | [SLO CS-11-F-01] Understand and apply safe & responsible use of information sources, identifying sources of reliable information compared to unreliable information and its sources | | | U | 1 |
| 17 | A: Q1(xvii) | Domain D | [SLO CS-11-D-01] Students will be able to relate the role and importance of model building with their real-world applications | | | U | 1 |
| Section B and C | | | | | | | |
| 18 | B: Q2(i) | Domain C | OR Domain B | [SLO CS-11-C07] Students will determine ways of debugging their code in Python | OR [SLO CS-11-B-01] Plan, develop, systematically test, and refine computational artifacts for problem-solving such as pseudocode, | U | 3 |
| 19 | B: Q2(ii) | Domain D | OR Domain E | [SLO CS-11-D-01] Students will be able to relate the role and importance of model building with their real-world applications | OR [SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain | K | 3 |
| 20 | B: Q(iii) | Domain A | OR Domain D | [SLO CS-11-A-02] Students will be able to understand and evaluate stages of the systems design, e.g. software development life cycle (analysis, design, coding, and testing etc.), and software development methodologies. | OR [SLO CS-11-D-01] Students will be able to relate the role and importance of model building with their real-world applications | U | 3 |
| 21 | B: Q(iv) | Domain H | OR Domain A | [SLO EN-11-H-01] Students will create, test, and iterate a prototype for a business idea | OR [SLO CS-11-A-03] Students will be able to understand and explain the scalability and reliability of networking systems | U | 3 |

| | | | | | | | |
|----|------------|----------|-----------------------|---|---|---|---|
| 22 | B: Q(v) | Domain C | OR Domain A | [SLO CS-11-C-06] Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python | OR [SLO CS-11-A-02] Students will be able to understand and evaluate stages of the systems design, e.g. software development life cycle (analysis, design, coding, and testing etc.), and software development methodologies. | U | 3 |
| 23 | B: Q(vi) | Domain F | OR Domain E | [SLO CS-11-F-02] Define and discuss how computing has increased connectivity by enabling communication between people and the environmental, cultural, and human impact of increased connectivity | OR [SLO CS-11-E-02] Students should be able to evaluate how different stakeholder’s culture, values, and (sometimes conflicting) interests affect AI System designs | K | 3 |
| 24 | B: Q(vii) | Domain B | OR Domain C | [SLO CS-11-B-02] Apply common search, and sort algorithms | OR [SLO CS-11-C-02] Students should be able to write and execute simple programs in Python | U | 3 |
| 25 | B: Q(viii) | Domain C | OR Domain A | [SLO CS-11-C-02] Students should be able to write and execute simple programs in Python. | OR [SLO CS-11-A-01] Students will be able to understand and apply logic gates in digital systems, define and create truth tables using Boolean operators like AND, OR, NOT, NAND, XOR) and logic diagrams. | U | 3 |
| 26 | B: Q(ix) | Domain G | OR Domain H | [SLO CS-11-G-01] Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations) | OR [SLO EN-11-H-01] Students will create, test, and iterate a prototype for a business idea | K | 3 |
| 27 | B: Q(x) | Domain A | OR Domain C | [SLO CS-11-A-01] Students will be able to understand and apply logic gates in digital systems, define and create truth tables using Boolean operators like AND, OR, NOT, NAND, XOR) and logic diagrams. | OR [SLO CS-11-C-06] Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python | A | 3 |

| | | | | | | | |
|----|------------|----------|-----------------------|---|--|---|---|
| 28 | B: Q(xi) | Domain G | OR Domain F | [SLO CS-11-G-01] Perform advanced searches to locate information and/or design a data-collection approach to gather original data (e.g. qualitative interviews, surveys, prototypes, simulations) | OR [SLO CS-11-F-02] Define and discuss how computing has increased connectivity by enabling communication between people and the environmental, cultural, and human impact of increased connectivity | K | 3 |
| 29 | B: Q(xii) | Domain A | OR Domain D | [SLO CS-11-A-01] Students will be able to understand and apply logic gates in digital systems, define and create truth tables using Boolean operators like AND, OR, NOT, NAND, XOR) and logic diagrams. | OR [SLO CS-11-D-02] Students will understand and explain experimental design in data science | U | 3 |
| 30 | B: Q(xiii) | Domain C | OR Domain C | [SLO CS-11-C-05] Students should be able to translate simple algorithms that use sequence and repetition in Python. | OR [SLO CS-11-C-06] Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python | A | 3 |
| 31 | C: Q3 | Domain A | OR Domain C | [SLO CS-11-A-01] Students will be able to understand and apply logic gates in digital systems, define and create truth tables using Boolean operators like AND, OR, NOT, NAND, XOR) and logic diagrams. | OR [SLO CS-11-C-06] Students should be able to decompose a problem into sub-problems and implement those sub-problems using functions in Python | A | 6 |
| 32 | C: Q4 | Domain D | OR Domain A | [SLO CS-11-D-02] Students will understand and explain experimental design in data science | OR [SLO CS-11-A-04] Understand and explain the need for cyber security and contrast different methods of encryption to transmit data. | U | 6 |
| 33 | C: Q5 | Domain B | OR Domain C | [SLO CS-11-B-02] Apply common search, and sort algorithms | OR [SLO CS-11-C-05] Students should be able to translate simple algorithms that use sequence and repetition in Python. | A | 6 |

| | | | | | | | |
|----|-------|-------------|-------------------------------------|--|---|---|---|
| 34 | C: Q6 | Domain E | <i>OR</i> Domain F | [SLO CS-11-E-01] Students should be able to describe technologies that are the foundations of IoT systems, Cloud Computing, and Blockchain | <i>OR</i> [SLO CS-11-F-01] Understand and apply safe & responsible use of information sources, identifying sources of reliable information compared to unreliable | K | 6 |
|----|-------|-------------|-------------------------------------|--|---|---|---|

*Cognitive Level
K: Knowledge
U: Understanding
A: Application

Table of Specification

Model Paper Computer Science – Grade XI (HSSC-I)

| Content Domain / Area | Domain A: Computer Systems | Domain B: Computational Thinking and Algorithms | Domain C: Programming Fundamentals | Domain D: Data and Analysis | Domain E: Applications of Computer Science | Domain F: Impacts of Computing | Domain G: Digital Literacy | Domain H: Entrepreneurship in the digital age | Total Marks | Percentage of cognitive levels |
|-----------------------|--|--|---|---|---|-----------------------------------|-------------------------------|--|-------------|--------------------------------|
| Cognitive Level | | | | | | | | | | |
| Knowledge | Q1(iii)1 | Q1(ii)1 | Q1(vi)1 | Q1(i)1 Q2(ii/f)3 | Q1(ix)1 Q2(ii/s)3 Q2(vi/s)3 Q6(f)6 | Q2(vi/f)3 Q2(xi/s)3 Q6(s)6 | Q2(ix/f)3 Q2(xi/f)3 | Q2(ix/s)3 | 41 | 28.67% |
| Understanding | Q1(iv)1 Q1(xv)1 Q2(iii/f)3 Q2(iv/s)3 Q2(v/s)3 Q2(viii/s)3 Q2(xii/f)3 Q4(s)6 | Q1(vii)1 Q2(i/s)3 Q2(vii/f)3 | Q1(xii)1 Q2(i/f)3 Q2(v/f)3 Q2(vii/s)3 Q2(viii/f)3 | Q1(xiv)1 Q1(xvii)1 Q2(iii/s)3 Q2(xii/s)3 Q4(f)6 | | Q1(xi)1 Q1(xvi)1 | Q1(v)1 Q1(viii)1 | Q1(x)1 Q1(xiii)1 Q2(iv/f)3 | 66 | 46.15% |
| Application | Q2(x/f)3 Q3(f)6 | Q5(f)6 | Q2(x/s)3 Q2(xiii/f)3 Q2(xiii/s)3 Q3(s)6 Q5(s)6 | | | | - | | 36 | 25.17% |
| Total Marks | 33 | 14 | 35 | 18 | 13 | 14 | 8 | 8 | 143 | - |
| Total Percentages | 23.07 | 9.79 | 24.48 | 12.59 | 9.09 | 9.79 | 5.59 | 5.59 | - | 100% |

Note:

- 1 This ToS does not reflect policy, but it is particular to this model question paper.
- 2 Proportionate / equitable representation of the content areas as per the defined ranges may be ensured.
- 3 The percentage of cognitive level is 30%, 50%, and 20% for knowledge, understanding, and application, respectively with $\pm 5\%$ variation.
- 4 While selecting alternative questions for Short Response Questions (SRQs) and Extended Response Questions (ERQs), it must be kept in mind that:
 - Difficulty levels of both questions should also be same
 - SLOs of both the alternative questions must be different

Key: Question Number (part/ first choice) marks example: **Q2 (i / f) 2**
 Question Number (part/ second choice) marks example: **Q2 (i / s) 2**



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